EXERCISE LEVEL –I

EL– I

Q.1 If $A \equiv (t^2, 2t)$, $B \equiv (\frac{1}{t^2}, -\frac{2}{t})$ and $S \equiv (1,0)$, then $\frac{1}{SA} + \frac{1}{SB}$ is equal to

(a) 2 (b) $\frac{1}{2}$ (c) $\frac{1}{5}$ (d) 1

Q.2 Determine the area of the quadrilateral formed by the points (2, 1), (4, 3), (-1, 2), and (-3, -2).

(a) 18 (b) 36 (c) 54 (d) 72

Q.3 If the triangle, formed by the points (1, a), (2, b), and (c^2, -3), has its centroid situated on the x-axis, then.

(a) $a + b = 6$ (b) $a - b = 6$ (c) $a + b = 3$ (d) $a - b = 3$

Q.4 The midpoints of the sides AB, BC, and CA of triangle ABC are given as (6, 1), (-4, -3), and (2, -5) respectively. Determine the centroid of triangle ABC.

(a) (4,1) (b) $(\frac{4}{3}, -3)$ (c) $(\frac{4}{3}, 3)$ (d) $(-\frac{4}{3}, 3)$

Q.5 Find the coordinates of the in center of the triangle formed by the points (1, 2), (3, 4), and (2, 3).

(a) Does not exist (b) (-2, 3) (c) (2,-3) (d) (3, 3)

Q.6 If the line segment connecting the points (a, b) and (c, d) forms a right angle at the origin, then...

(a) $ac - bd = 0$ (b) $ac + bd = 0$ (c) $ab + cd = 0$ (d) $ab - cd = 0$

Q.7 If A (9, -9) and B (1, -3) represent the endpoints of the hypotenuse of a right-angled isosceles triangle, then determine the coordinates of the third vertex.

(a) (8,–2) (b) (–8, 2) (c) (8, 8) (d) (0, 0)

Q.8 If a line forms a 30° angle in the clockwise direction with the positive y-axis, then what is the slope of the line?

(a) $\sqrt{3}$ (b) $-\sqrt{3}$ (c) $\frac{1}{\sqrt{3}}$ (d) $-\frac{1}{\sqrt{3}}$

Q.9 Find the angle between the lines represented by the equations $3x + y - 7 = 0$ and $x + 2y + 9 = 0$.

(a) $\frac{\pi}{3}$ (b) $\frac{\pi}{6}$ (c) $\frac{\pi}{2}$ (d) $\frac{\pi}{4}$

Q.10 Determine the value of k such that the lines represented by the equations $kx + y = 6$ and $2x - 5y = 1$ are perpendicular to each other.

(a) $-\frac{5}{2}$ (b) $\frac{2}{5}$ (c) $\frac{5}{2}$ (d) $-\frac{2}{5}$

Q.11 Find the equation of the line that is perpendicular to $3x - y + 9 = 0$ and passes through the origin.

(a) $3x + y = 0$ (b) $x + 3y = 0$ (c) $3x - y = 0$ (d) $x - 3y = 0$

Q.12 Determine the x-axis intercept of the line represented by the equation $5x + 12y - 60 = 0$.

(a) 12 (b) –12 (c) 5 (d) –5

Q.13 Find the equation of the line that intercepts the axes of coordinates with equal magnitudes but opposite signs, and passes through the point (2, 3).

(a) $x - y + 1 = 0$ (b) $x + y - 5 = 0$ (c) $2x + y - 7 = 0$ (d) $2x - y - 1 = 0$

Q.14 Find the equation of the line with x-intercept 3 and y-intercept 8.

(a) $3x + 8y - 24 = 0$ (b) $8x + 3y - 24 = 0$

(c) $3x + 8y + 24 = 0$ (d) $8x + 3y + 24 = 0$

Q.15 Express the equation of the line passing through the point (2, 3) with a slope of $\sqrt{3}$ in its symmetric form or parametric form.

(a) $\frac{x-2}{\frac{\sqrt{3}}{2}} = \frac{y-3}{\frac{1}{2}} = r$ (b) $x - 2 = y - 3 = r$

(c) $\frac{x-2}{\frac{1}{2}} = \frac{y-3}{\frac{\sqrt{3}}{2}} = r$ (d) $\frac{x-1}{2} = \frac{y-3}{\sqrt{3}} = r$

Q.16 When expressed in normal form, the equation 3x + 2y - 6 = 0, the coefficient "a" is equivalent to.
(a) $\tan^{-1}(\frac{2}{3})$ (b) $\tan^{-1}(-\frac{3}{2})$ (c) $\tan^{-1}(-\frac{2}{3})$ (d) $\tan^{-1}(\frac{3}{2})$

Q.17 Determine the interval of values for α, such that the points (α, α^2) and (0, 0) lie on the same side of the line 3x + y - 10 = 0.
(a) (2,5) (b) $(-\infty,-5) \cup (2,\infty)$ (c) $(-5,2)$ (d) $(-2,5)$

Q.18 Identify the point that lies on the line given by the equation 3x - 4y + 5 = 0.
(a) (2,1) (b) (0,0) (c) (1,2) (d) $(-1,1)$

Q.19 Among the following points, which one is located inside the triangle formed by the equation x + y = 5 and the coordinate axes?
(a) (2,2) (b) (3,3) (c) (0,0) (d) $(-1,-1)$

Q.20 If (a, a^2) falls inside the angle made by the linear equations $y = \frac{x}{2}, x > 0$ and $y = 3x, x > 0$ then a belong to.
(a) $(-3,-\frac{1}{2})$ (b) $(0,\frac{1}{2})$ (c) $(3,\infty)$ (d) $(\frac{1}{2},3)$

Q.21 The line denoted by $\frac{x}{5} + \frac{y}{b} = 1$ passes through the point (13, 32). The line K is parallel to L and has the equation $\frac{x}{c} + \frac{y}{3} = 1$ then the distance between L and K is
(a) $\frac{17}{\sqrt{15}}$ (b) $\frac{23}{\sqrt{17}}$ (c) $\frac{23}{\sqrt{15}}$ (d) $\sqrt{17}$

Q.22 The base of an equilateral triangle is given by the equation x + y = 2, and its vertex is located at (2, -1). Calculate the area of the triangle in square units.
(a) 1 (b) $\frac{1}{\sqrt{3}}$ (c) $\frac{1}{2\sqrt{3}}$ (d) $\sqrt{\frac{3}{2}}$

Q.23 Determine the area enclosed by the curves x + 2y = 1 and x = 0.
(a) $\frac{1}{4}$ (b) $\frac{1}{2}$ (c) 1 (d) 2

Q.24 A light ray moving along the line $x + \sqrt{3}y = 5$ incides on the x-axis and, upon refraction, it enters the opposite side of the x-axis by changing direction $\frac{\pi}{6}$ away from the x-axis. Provide the equation of the line along which the refracted ray moves.
(a) $x + \sqrt{3}y - 5\sqrt{3} = 0$ (b) $x - \sqrt{3}y - 5\sqrt{3} = 0$
(c) $\sqrt{3}x + y - 5\sqrt{3} = 0$ (d) $\sqrt{3}x - y - 5\sqrt{3} = 0$

Q.25 A light ray travels along the line passing through the point (2, 3) and is reflected from a point P on the x-axis. If the reflected ray passes through the point (6, 4), determine the coordinates of point P.
(a) $(\frac{26}{7},0)$ (b) $(0,\frac{26}{7})$ (c) $(\frac{-26}{7},0)$ (d) $(-3,0)$

Q.26 A person initiates the journey from point P(-3, 4) and aims to reach point Q(0, 1) while making contact with the line 2x + y = 7 at the point R. Find the coordinates of R on the line that ensures the person travels the shortest distance.
(a) $(\frac{42}{25},\frac{91}{25})$ (b) $(\frac{91}{25},\frac{42}{25})$ (c) $(0,\frac{42}{25})$ (d) $(\frac{42}{25},0)$

Q.27 Consider three points: P = (-1, 0), Q = (0, 0), and R = $(\sqrt{3}, 3)$. Determine the equation of the angle bisector of ∠PQR.
(a) $\sqrt{3}x + y = 0$ (b) $x + (\frac{\sqrt{3}}{2})y = 0$ (c) $(\frac{\sqrt{3}}{2})x + y = 0$ (d) $x - \sqrt{3}y = 0$

Q.28 The equation of a line with a slope $-\frac{3}{2}$ and which intersects with the lines $4x + 3y - 7 = 0$ and $8x + 5y - 1 = 0$ is
(a) $3x + 2y - 63 = 0$ (b) $2y - 3x - 2 = 0$
(c) $3x + 2y - 2 = 0$ (d) $3x - 2y - 2 = 0$

Q.29 The equations representing the sides of a triangle are $x = 0, y = m_1x + c_1$ and $y = m_2x + c_2$.the area of triangle is.
(a) $|\frac{c_1-c_2}{m_1-m_2}|$ (b) $\frac{1}{2}|\frac{(c_1-c_2)^2}{m_1-m_2}|$ (c) $\frac{1}{2}|\frac{c_1-c_2}{(m_1-m_2)^2}|$ (d) $|\frac{(c_1-c_2)^2}{(m_1-m_2)^2}|$

Q.30 If the lines x + 2ay + a = 0, x + 3by + b = 0, and x + 4cy + c = 0 intersect at a common point, then the values of a, b, c are in.
(a) A.P. (b) G.P. (c) H.P. (d) A.G.P.

Q.31 The point (1, 2) is given in a rectangular Cartesian coordinate system. If the axes are rotated by an angle of 45° in the positive direction without altering the origin, determine the coordinates of the point in the new system.

(a) $(\frac{3}{\sqrt{2}}, 1)$ (b) $(\frac{3}{\sqrt{2}}, \frac{2}{\sqrt{2}})$ (c) $(\frac{3}{\sqrt{2}}, \frac{-1}{\sqrt{2}})$ (d) $(\frac{3}{\sqrt{2}}, \frac{1}{\sqrt{2}})$

Q.32 The coordinates of a point P in a rectangular coordinate system with O as the origin are (1, -2). The axes are rotated about O by an angle θ. If the coordinates of P in the new system are (k-1, k+1), then the value of k^2 is equal to.

(a) $\frac{4}{5}$ (b) $\frac{2}{3}$ (c) $\frac{3}{2}$ (d) $\frac{5}{4}$

Q.33 The line connecting two points A (2, 0) and B (3, 1) undergoes a counter-clockwise rotation about point A by an angle of 15°. If B transforms to C in the new position, determine the coordinates of C.

(a) $(2\sqrt{2}, \frac{\sqrt{3}}{\sqrt{2}})$ (b) (1,1) (c) $(\frac{4+\sqrt{2}}{2}, \frac{\sqrt{3}}{\sqrt{2}})$ (d) $(2, \frac{\sqrt{3}}{2})$

Q.34 While keeping the origin fixed, the coordinate axes undergo a rotation by an angle θ. If the equation of the line $\frac{x}{a} + \frac{y}{b} = 1$ in relation to the new axes is $\frac{x}{p} + \frac{y}{q} = 1$, then

(a) $a^2p^2 + b^2q^2 = 1$ (b) $\frac{1}{a^2} + \frac{1}{b^2} = \frac{1}{p^2} + \frac{1}{q^2}$

(c) $a^2 + b^2 = p^2 + q^2$ (d) $\frac{1}{a^2} + \frac{1}{p^2} = \frac{1}{b^2} + \frac{1}{a^2}$

Q.35 Centroid of the triangle, with equations for its sides as $12x^2 - 20xy + 7y^2 = 0$ and $2x - 3y + 4 = 0$ is

(a) $(\frac{8}{3}, \frac{8}{3})$ (b) $(\frac{4}{3}, \frac{4}{3})$ (c) (2,2) (d) (1,1)

Q.36 The equations of lines passing through the origin and perpendicular to the pair of straight lines given by x^2-3xy + $2y^2 = 0$ are

(a) $2x^2 - 3xy + y^2 = 0$ (b) $2x^2 + 3xy - y^2 = 0$

(c) $2x^2 + 3xy + y^2 = 0$ (d) $2x^2 - 3xy - y^2 = 0$

Q.37 Determine the value of h for which the equation $3x^2$ - 2hxy + $4y^2 = 0$ represents a pair of coincident lines.

(a) $\pm 3\sqrt{3}$ (b) $\pm\sqrt{3}$ (c) $\pm 2\sqrt{3}$ (d) $\pm\sqrt{6}$

Q.38 The sum of the values of h, given that the area of the triangle formed by the points (0, 0), (h, 0), and (0, 4) is 2, is:

(a) 1 (b) 2 (c) 0 (d) 4

Q.39 If the coordinates of a triangle's vertices are always rational, then the triangle cannot be

(a) Scalene (b) Isosceles (c) Right angle (d) Equilateral

Q.40 If m is the slope of a line and $m = \sec\theta$, where θ is deleted real neighborhood of $\frac{\pi}{2}$ then the possible angle between line and x – axis is.

(a) 0° (b) 90° (c) 60° (d) 45°

Q.41 If $x = x_1 \pm r\cos\theta, y = y_1 \pm r\sin\theta$ be the equation of straight line then the parameter in this equation is.

(a) θ (b) x_1 (c) y_1 (d) r

Q.42 In △ ABC, if A ≡ (1,2) and equation of the median through B and C are $x + y = 5$ and $x = 4$ then point B must be.

(a) (1,4) (b) (7, −2) (c) (4,1) (d) (−2,7)

Q.43 If the equation of the base of an equilateral triangle is x + y = 2, and the vertex is located at (2, 1), then the length of the side of the triangle is equivalent to.

(a) $\sqrt{\frac{2}{3}}$ (b) $\sqrt{\frac{1}{3}}$ (c) $\sqrt{\frac{3}{2}}$ (d) $\sqrt{3}$

Q.44 The equation of a straight line that is equally inclined to the axes and equidistant from the points (1, 2) and (3, 4) is

(a) $x + y + 1 = 0$ (b) $x - y + 1 = 0$ (c) $x - y - 1 = 0$ (d) $x + y - 1 = 0$

Q.45 The equation of the bisector of the acute angle between the lines 3x - 4y + 7 = 0 and 12x + 5y - 2 = 0 is

(a) $11x + 3y - 9 = 0$ (b) $3x - 11y + 9 = 0$

(c) $11x - 3y - 9 = 0$ (d) $11x - 3y + 9 = 0$

Q.46 The potential values of for which the following three lines $x + y = 1, \lambda x + 2y = 3, \lambda^2 x + 4y + 9 = 0$ are concurrent is.

(a) 2 (b) 14 (c) –15 (d) –13

Q.47 The straight line $ax + by = 1$ make with the curve, $px^2 + 2axy + qy^2 = r$ a chord which subtends a right angel at the origin. Then

(a) $r(b^2 + q^2) = p + a$ (b) $r(b^2 + p^2) = p + q$

(c) $r(a^2 + b^2) = p + q$ (d) $(a^2 + p^2)r = q + b$

Q.48 The middle point of the line segment joining $(3, -1)$ and $(1,1)$is shifted by two units (in the sense increasing y) perpendicular to the line segment. Then the coordinate of the point in the new position is.

(a) $(2 - \sqrt{2}, \sqrt{2})$ (b) $(\sqrt{2}, 2 + \sqrt{2})$ (c) $(2 + \sqrt{2}, \sqrt{2})$ (d) $(\sqrt{2}, 2 - \sqrt{2})$

Q.49 The intersection point of the straight line $3x + 5y = 1$ and $(2 + c)x + 5c^2y = 1$ where $c \neq 1$ and $-\frac{3}{2}$, is

(a) $(\frac{1}{3c+2}, \frac{3}{3c+2})$ (b) $(\frac{c-1}{3c+2}, \frac{-1}{5(3c+2)})$ (c) $(\frac{c-1}{3c+2}, \frac{1}{5(3c+2)})$ (d) $(\frac{c+1}{3c+2}, \frac{-1}{5(3c+2)})$

Q.50 As the endpoints A and B of a straight line segment of constant length c move along the fixed rectangular axes OX and OY, respectively, completing the rectangle OAPB, determine the locus of the foot of the perpendicular drawn from P onto AB.

(a) $x^{2/3} - y^{2/3} = c^{2/3}$ (b) $x^{1/3} + y^{1/3} = c^{1/3}$

(c) $x^{2/3} + y^{2/3} = c^{2/3}$ (d) $x^{1/3} - y^{2/3} = c^{1/3}$

Q.51 Consider the variable line given by $y = mx$, where m is a variable. This line intersects the lines $2x + y = 2$ and $x - 2y + 2 = 0$ at points P and Q. Determine the locus of the midpoint of the segment PQ.

(a) $2x^2 + 3xy - 2y^2 + x + 3y = 0$ (b) $2x^2 - 3xy - 2y^2 + x + 3y = 0$

(c) $2x^2 + 3xy + 2y^2 + x + 3y = 0$ (d) $2x^2 + 3xy - 2y^2 - x - 3y = 0$

Q.52 A variable straight line passes through the points of intersection of the lines $x + 2y = 1$ and $2x - y = 1$. It intersects the coordinate axes at points A and B. Find the locus of the midpoint of AB.

(a) $3xy = (x - y)$ (b) $3xy = x + y$ (c) $10xy = x + 3y$ (d) $xy = x + 3y$

Q.53 If $A(\cos\alpha, \sin\alpha), B(\sin\alpha, -\cos\alpha), C(2,1)$ are vertical of a triangle ABC. The locus of its centroid if α varies is.

(a) $9x^2 + 9y^2 - 3x + 6y - 2 = 0$ (b) $9x^2 + 9y^2 - 12x + 6y - 3 = 0$

(c) $9x^2 + 9y^2 - 12x - 6y + 3 = 0$ (d) $9x^2 + 9y^2 + 12x + 6y - 3 = 0$

Q.54 Determine the locus of the midpoint of the intercept on the line $y = x + c$, created by the lines $2x + 3y = 5$ and $2x + 3y = 8$, where c is a parameter.

(a) $2x + 3y + 13 = 0$ (b) $4x + 6y + 13 = 0$

(c) $4x + 6y - 13 = 0$ (d) $2x + 3y - 13 = 0$

EXERCISE LEVEL –II

EL– II

Q.1 The slope of the straight line that goes through the points (1, 5) and (-2, -4) is ______.

Q.2 Determine the values of x and y for a straight line passing through the points (x, -9), (2, 5), and (5, y) with a slope of 2.

Q.3 Calculate the slope of the line that passes through the given point.

(a) (1, 2) ;(4, 2) (b) (4,–6); (–2,–5)

Q.4 Determine the value of y so that the line passing through (3, y) and (2, 7) is parallel to the line passing through (-1, 4) and (0, 6).

Q.5 If the sum of the slopes of two perpendicular straight lines is equal to $\frac{3}{2}$, determine the slopes of these lines.

Q.6 For three points P (h, k), Q (x_1, y_1), and R (x_2, y_2) lying on a line, demonstrate the following relationship: $(h-x_1)(y_2-y_1)=(k-y_1)(x_2-x_1)$.

Q.7 Calculate the equations of the sides of the triangle with vertices at (2,1), (-2,3), and (4,5).

Q.8 Determine the equation of the straight line that goes through the given points.

(a) (–1,–2) and (–5,–2) (b) (1,–1) and (3,5)

Q.9 (a) Determine the equation of the straight line that goes through the point (0, 1) and forms a 60-degree angle with the x-axis.

(b) Calculate the equation of the straight line that goes through the point (2, 2) and is angled at 45 degrees relative to the x-axis.

Q.10 Determine the equation of the straight line that:

(a) Crosses the x-axis 3 units to the left of the origin with a slope of -2.

(b) Crosses the y-axis 2 units above the origin and forms a 30° angle with the positive x-axis.

Q.11 If P (a, b) serves as the midpoint of a line segment between the coordinate axes, demonstrate that the equation of the line can be represented as $\frac{x}{a}+\frac{y}{b}=2$

Q.12 A line forms a triangle with the coordinate axes, and the area of this triangle is $54\sqrt{3}$ square units. The perpendicular line drawn from the origin to the line makes a 60° angle with the x-axis. Determine the equation of the line.

Q.13 Express the equation $x + 2y = 3$ in intercept form.

Q.14 Convert each of the following equations into slope-intercept form and determine their slopes and y-intercepts:

(a) $7x+3y-6=0$ (b) $3x+3y=5$ (c) $y=0$

Q.15 convert each of the following into perpendicular form and determine the value of 'p':

(a) $3x-4y+10=0$ (b) $\sqrt{3}x+y-8=0$

Q.16 Determine the length of the perpendicular line drawn from vertex B of triangle ABC to the median through point C, given that point A is located at (-10, -13), point B is at (-2, 3), and point C is at (2, 1).

Q.17 Find the equation of the line that is equidistant from parallel line represented by

$9x+6y-7=0$ and $3x+2y+6=0$

Q.18 Classify the following pairs of lines as coincident, parallel, perpendicular or intersecting:

(a) $6x+14y-16=0$ $12x+28y-32=0$

(b) $3x-4y=8$, $3x+4y=11$

(c) $5x-2y=7$ $2y-5x=-7$

Q.19 Demonstrate that the origin is at an equal distance from three straight lines:

$$4x + 3y + 10 = 0, 5x - 12y + 26 = 0 \text{ and } 7x + 24y = 50$$

Q.20 Determine the angle of inclination of the line given by the equation x - y + 3 = 0 with respect to the positive direction of the x-axis.

Q.21 Determine the angle formed by the lines connecting the points (3, 1) and (2, 3), as well as the points (5, 2) and (9, 3).

Q.22 Demonstrate that the line 5x - 2y + 10 is the mid-parallel between the lines 5x - 2y + 90 and 5x - 2y + 7 = 0.

Q.23 Determine the value of k if the lines 2x + y = 30, 5x + ky = 30, and 3x - y - 20 are concurrent.

Q.24 Demonstrate collinearity for the points (a, 0), (0, b), and (3a, 2b). Additionally, determine the equation of the line that passes through these points.

Q.25 From the point P(3,5), draw a line inclined at an angle of 45° with the positive x-axis. The line intersects the line x + y = 6 at point Q. Calculate the length of PQ.

Q.26 If the points (a, 0), (0, b), and (3, 4) are collinear, then demonstrate that. $\frac{3}{a} + \frac{4}{b} = 1$.

Q.27 Determine the equations of the lines that pass through the point (1, 0) and are at a distance of $\frac{\sqrt{3}}{2}$ from the origin.

Q.28 Determine the equation of one side of an isosceles right-angled triangle, given that its hypotenuse is defined by 3x + 4y = 4, and the vertex opposite to the hypotenuse is located at (2, 2).

Q.29 Determine the reflection of the point (4, -13) across the line 5x + y + 6 = 0.

Q.30 If a square has one diagonal along the line 8x - 15y = 0, and one of its vertices is at (1, 2), determine the equation of the sides of the square passing through this vertex.

ANSWER KEY – LEVEL – I

Q.	1	2	3	4	5	6	7	8	9	10
Ans.	d	a	c	b	a	b	a	a	d	c
Q.	11	12	13	14	15	16	17	18	19	20
Ans.	b	a	a	b	c	a	c	c	a	d
Q.	21	22	23	24	25	26	27	28	29	30
Ans.	b	c	b	c	a	a	a	b	b	c
Q.	31	32	33	34	35	36	37	38	39	40
Ans.	d	d	c	c	b	c	c	c	d	b
Q.	41	42	43	44	45	46	47	48	49	50
Ans.	d	b	a	c	d	c	c	c	d	c
Q.	51	52	53	54	55	56	57	58	59	60
Ans.	b	c	c	c						

ANSWER KEY – LEVEL – II

1. 3
2. x= –5, y =11
3. (a) 0 (b) $-\frac{1}{6}$
4. 9
5. 2 and $-\frac{1}{2}$
7. $x + 2y - 4 = 0$ $x - 3y + 11 = 0$ $2x - y - 3 = 0$
8. (a) y+2=0 (b) –3x+y+4=0
9. (a) $\sqrt{3}x - y + 1 = 0$ (b) x – y =0
10. (a) 2x+y+6=0 (b) $x - \sqrt{3}y + 2\sqrt{3} = 0$
12. $x + \sqrt{3}y - 18 = 0$
13. $\frac{x}{3} + \frac{y}{\frac{3}{2}} = 1$
14. (a) $y = \frac{-7}{3}x + 2; -\frac{7}{2}, 2$ (b) $y = -x + \frac{5}{3}; -1, \frac{5}{3}$ (c) $y = 0.x + 0; 0,0$
15. (a) $\frac{-3}{5}x + \frac{4}{5}y = 2; p = 2$ (b) $\frac{\sqrt{3}}{2}x + \frac{1}{2}y = 4; p = 4$
16. 4
17. $18x + 12y + 11 = 0$
18. (a) coincident (b) Intersecting (c) Coincident